Reviewer’s report

Title: Investigating the self-study phase of an inverted biochemistry classroom - collaborative dyadic learning makes the difference

Version: 1 Date: 07 Mar 2018

Reviewer: Amin Azzam

Reviewer’s report:

This is an elegantly designed study investigating the influence of both study materials and instruction provided to medical students enrolled in an inverted classroom phase of a biochemistry course in early medical school. The authors do a nice job describing their study design, and are to be applauded for the decision to include 2 control groups (the first being students in the "basis" group and the second being students in the "individual study" group). They have taken time to ensure and report how all 3 groups were homogenous relative to student sociodemographic characteristics.

My comments are offered in the spirit of raising the scholarly rigor of all medical education innovation and research. I trust the authors to react to these in the collaborative-spirit in which they are intended.

1. Manuscript page 4, line 21, sentence that begins with "This is supported by others showing a high student's prevalence...": Like you do with most other sentences, I recommend moving the reference [21] to the end of this sentence as it is easier and clearer to read that way.

2. Manuscript page 13, line 18: I appreciate the explicit acknowledgement that in the dyad study group only 64% (self-study phase 1) and 58.7% (self-study phase 2) actually prepared in a learning dyad as instructed. But because these percentages of "adherent" students are relatively small, I think it is important to acknowledge this more explicitly in your discussion section. Of course this problem of "non-adherent" dyads only underestimates the power of your findings, suggesting that the more students study in dyads (as contrasted with individual study) the more they will learn. I think you should also make this point explicitly somewhere in the discussion or limitations section. I would recommend putting it in the limitations section.

3. Manuscript page 15, line 2: Your statement that the results imply that the learning behavior of the students (e.g. collaborative vs. individual) has a stronger influence on the learning outcome is actually an extremely important finding. I would appreciate if you emphasized this again in the discussion section. I believe this is important because I surmise that most educators erroneously believe that the instructional material given is actually more important that the study approach.

4. Manuscript page 15, section about hypothetical dyads: You are to be commended on testing the hypothesis that knowledge acquisition of the "weaker" student in dyads is "merely" due to the superior intellect of the "stronger" student. This is an excellent reassurance that the findings are
in fact due to what you hypothesized (namely that working collaboratively increases knowledge acquisition in inverted classroom models of instruction).

5. Manuscript page 16, line 23, sentence that begins with "To analyze students' motivation...": I suggest changing the word "the interest" to be rephrased as "their interest in biochemistry" as that is less confusing to the reader.

6. Manuscript page 19, line 14, sentence that begins with "We here showed that..": I propose a modification of the sentence structure (which I think reads easier) as "...in the self-study phase in an IC is dependent upon the instruction given on how to organize the self-study phases."

7. Manuscript page 21, line 11, sentence that begins with "In our study, we use the two script...:" I suggest a modification of the sentence structure as "In our study, we used two script components (play and scene) according to..." as putting the components within the parenthetical is similar to what you do describing the 4 components earlier in the paragraph above.

8. Figure 2 Legend, page 34, line 8, sentence that begins with "Self-study phase 2 was similar to the first one:" I propose modifying the sentence as "Self-study phase 2 was similar to Self study phase 1."

9. Figure 2 Legend, page 34, line 10, sentence that begins with "Study procedure of the collaborative group:" I propose modifying the sentence as "...of the collaborative group was the same as that of the individual group..."

**Are the methods appropriate and well described?**
If not, please specify what is required in your comments to the authors.

Yes

**Does the work include the necessary controls?**
If not, please specify which controls are required in your comments to the authors.

Yes

**Are the conclusions drawn adequately supported by the data shown?**
If not, please explain in your comments to the authors.

Yes

**Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?**
If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

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